which are mentioned on the fly-leaf to Volume 6 as being innovations in the new series to give greater emphasis to physical chemistry. These articles are definitely more suitable for a text-book on pure physical chemistry. An applied chemist will find that a reasonable appreciation of the fundamentals of aerodynamics together with diffusion theory will be far more helpful in actual practice than the theoretical material given under the heading of heterogeneous reactions. Hydrogen ion concentration has very many and varied applications in industry, and books have been written on the subject. Here, however, it is dismissed in a short notice on how it can be measured.

This lack of attention to the word "Applied" on the title-page is shown in other ways. Practically no attention is given to the economic side of chemical manufacture. As an example, the article on glucinium might be taken. If anyone wished to manufacture beryllium at the present moment, he would be ill advised to think that the information given him in Volume 6 of this dictionary is sufficient for his purpose.

It is invariably advisable when adopting an applied process to make a thorough search of the patent literature. It would therefore be more comparable with commercial conditions if the patent references outnumbered the others. Actually, the reverse is the case.

There would seem to be a requirement for a simple statement to act as a guiding principle in applied chemistry. The physicist has, for example, Fermat's principle, which states that, "The path of a ray of light from point to point is always such that the time taken by the light to traverse it is a minimum". Similarly, in the realm of mathematics, we have the names of Maupertuis and Hamilton and the Principle of Least Action. In applied chemistry the principle could be stated as, "The production of one chemical compound from another will follow such intermediate stages as result in the time taken to make a unit quantity of the product being reduced to a minimum".

This statement might sound like a platitude, but experience goes to show that its importance is only very slightly understood even in circles where the level of intelligence on other matters is very high. The phrase 'time taken' requires perhaps further definition. The time taken in manufacturing the plant for carrying out the reaction, the time taken in producing the energy supplied to the reaction in the form of electricity, steam, etc., and the time which is covered by the various items of chemical works costing are all best expressed by a monetary value which allows the time factor to be expressed in comparable units. The expression 'man-hours' is possibly the more justifiable unit but is not necessarily so easy to compute.

The outstanding feature of Volume 5 is the collection of articles on fibres. They include "Cotton" by Dr. A. J. Turner, "Rayon" by J. M. Preston, "Finishing Textile Fabrics" by E. Clayton, "Animal Wool" by Dr. J. B. Speakman, "Vegetable Fibres" by E. L. Hill, and "Silk" by Dr. C. S. Whewell. These articles also raise a point of interest to the general reader seeking information. Would it not have been better to have preceded this collection of articles by a short introduction on the industry as a whole and the meaning of the numerous technical terms used in it? Nearly all the ancient industries such as textiles, leather, brewing, etc., have a wealth of technical words which do not appear in the usual dictionaries and which therefore need defining for the non-expert. Thus under "wool", we read about wool quality as estimated by the grower and referred to as "60's–64's Cape Merino wool", but how does the grower estimate the wool, and why does he use these numbers? What is meant by "denier" and "counts"? How does the length and thickness of the fibre affect the subsequent processing? Perhaps a Baer diagram might help the novice. What are the principles which affect the wearing properties of the textiles? Why are some cold and some warm to wear? Why do some crease and some drape? It might be argued that these are not chemical problems, but they are at least the qualities which ultimately influence the direction of the policy of future development of all chemically produced fibres. Attention should also be directed to an extensive article on glass by Dr. H. Moore, others on fuel by Dr. G. W. Himus, and on coal and water gas by Dr. H. Hollings and E. G. Stewart and W. A. Voss respectively. Under fermentation, the late Sir Arthur Harden writes on the alcoholic side, Dr. J. H. Birkinshaw on mould and Dr. M. Stephenson on bacterial. Other articles worthy of mention are on fertilizers, by Dr. B. Dyer, formaldehyde, by Dr. H. M. Stanley, and fluorine, by Dr. H. J. Emeléus.

Volume 6 also contains a number of interesting articles, especially those by Dr. E. H. Rodd on indigo dyestuffs, Drs. E. Lewkowitsch and H. E. Cox on glycerine, H. S. Coles and Dr. P. H. Sykes on hydrogenation, Sir T. K. Rose on gold, W. H. Hoffert on gum inhibitors, Dr. D. Burton on glue, Prof. G. A. R. Kon on hormones, Dr. C. A. Mitchell on ink, Drs. J. A. Kitchener and M. Carlton on hydrogen peroxide, Dr. R. Holyroyd on coal hydrogenation, and Dr. A. J. E. Welch on helium. The article on grassland by Dr. J. A. Hanley might well have been expanded in view of the importance of its proper utilization and of the drying of grass for storage in relation to the agricultural economy and self-sufficiency of the nation. Similar comments might be made of A. G. Pollard's articles on gooseberry, grape, grapefruit, honey and huckleberry, even after allowing for the nostalgic feelings they engender after these years of war.

M. B. DONALD.

NEW LIGHT ON TELEPATHIC PHENOMENA

Experiments in Precognitive Telepathy

By S. G. Soal and K. M. Goldney. (*Proceedings of the Society for Psychical Research*. Part 162, December 1943.)

THE experiments here described, which were conducted by the authors during about two and a quarter years, are some of the most interesting and suggestive hitherto recorded. For a number of years the Society for Psychical Research has been supporting a number of experiments in the field of what has been called 'extra-sensory perception', and gradually a mass of evidence has been accumulated which is throwing a good deal of light upon phenomena which have been perhaps some of the most hotly disputed in the whole field of recent work in psychical research.

Generally speaking, the essential core of the experiments consists in the examination of the scores

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attained by 'guessing' symbols or pictures in sets of five cards for convenience of statistical analysis. In a number of these tests the subject tries to guess the symbol or picture on a card that is being looked at by an experimenter seated in an adjoining room, his score being later examined to ascertain if he had attained more correct hits than the theory of probability would predict.

Now since the experiments were first started, there has been a very large volume of criticism designed to expose alleged sources of error in the actual work and faulty employment of statistical theory in evaluating the results. In the present series it would seem, judging from the record presented, that such criticisms would be beside the point. Rarely has such scrupulous care been exercised to avoid all possible source of error, and the statistical methods employed were so simple that attempts to discredit them would probably be a waste of time. Moreover, some of the results obtained excluded by their very nature many of the commonly alleged sources of error, and at the same time revealed some surprising effects which had been suspected and later proved to have occurred in previous experiments.

In the past, the prevailing tendency was to study the success obtained by the percipient in guessing the symbol which was being contemporaneously looked at by the agent. In a number of such cases it seemed that certain subjects were successful in scoring over a considerable period many more correct hits than the theory of probability would lead us to expect. But at the same time it appeared that when the records were carefully examined, the 'successes' were not always of the 'now or never' type, but a kind of displacement occurred both backwards and forwards; so that it seemed that at times the card images were becoming known to the percipient before the agent himself was consciously aware of them.

In the present series of tests this phenomenon is further examined, since the subject with whom the work was done appeared to find it easier to score hits, not on the card that was being looked at by the agent, but on the cards which immediately precede or follow it in sequence. The normal rate of guessing varied between limits of 50 sec. and 80 sec. for twenty-five calls, but when this rate was speeded up the cognition of the card in advance of that being looked at by the agent was replaced by a cognition of the card *two ahead* of the one being concentrated upon. This very remarkable effect is in itself sufficiently surprising, while at the same time it disposes of much of the criticism which might have been valid in badly conducted experiments where scores were solely confined to the card being looked at by the agent.

The theory that these effects are due to chance coincidence is considered by the authors of the reports to be completely untenable. For example, to take the one-ahead or precognitive (+1) guessing only, the results are highly significant, for the excess is equivalent to 13·6 standard deviations with odds of more than 10^{35} to 1 against chance.

In discussing the interpretation of these phenomena the authors very wisely make no attempt to deal in any way fully with their psychological and philosophical implications. It is clear, however, that if the results be upheld, light may be thrown not only upon our ideas of time but also of the nature of memory; and moreover, it seems that the earlier and naïve ideas of 'thought-transmission' may have to be abandoned. In any event we have here another step forward in the design of experiments of this kind, and the authors are to be congratulated upon their arduous labour, their scrupulous care in conducting and recording their work and their wisdom in not attempting facile explanations to describe the nature of phenomena the meaning and interpretation of which are likely to elude us for a long time to come.

E. J. DINGWALL.

EARLY SPANISH POSSESSIONS OF THE NEW WORLD AND FAR EAST

Compendium and Description of the West Indies By Antonio Vázquez de Espinosa. Translated by Charles Upson Clark. (Smithsonian Miscellaneous Collections, Volume 102, Pub. 3646.) Pp. xii+862. (Washington: Smithsonian Institution, 1942.)

IF one has a complaint against the editor and the producers of this important work, it is that the title is seriously misleading. Mr. C. U. Clark has provided a most informative introduction, and there is a very full index. The main body of the text, running to nearly 800 pages, is a translation of a manuscript in the Vatican. The original, written by Antonio Vázquez de Espinosa, for the Council of the Indies, was called a description of the Indies and dealt with all the Spanish territory in the New World as well as that in the Far East. We have here, therefore, a detailed account of a large part of North, Central and South America, the Philippines and Moluccas as well as what are now known as the West Indies, as it was about the year 1620.

It is impossible in a short review to do more than allude to the many interesting features of this work, only a small part of which has been previously published. There are valuable details of discovery, with a new account of the notorious Aguirre. Natural phenomena, like earthquakes and floods, trees, cultivated plants, mineral resources, the customs of the native population, and full details of the Spanish colonial administration fill the pages of Espinosa's work. He was a Carmelite missionary and was therefore naturally interested in church matters: and education figures largely. But there is no undue praise of what the Spaniards had accomplished. His descriptions of depopulation, "a general curse in the Indies", neither conceal the facts nor avoid the inevitable consequences, though not all were attributed to misconduct or bad administration. On the other side of the account are the constructive works of the Europeans. The great city of Lima, for example, known as The Kings, founded in 1533, is minutely described, with its irrigation works, its water supply, its rectangular blocks of buildings separated by wide streets, its four plazas, its government buildings, churches, ecclesiastical dignitaries, convents, nunneries, hospitals, university, colleges, and, two leagues away, across an arid plain, the port of Callao with its garrison, shops, stores, mills, and a good, safe harbour "free from shipworms", for "the sea water is so cold here that they chill beverages in it".

Such descriptions, with immense detail of great interest, are frequent. In short, this work will provide historians and naturalists with invaluable information on all parts of the old Spanish colonial world.

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